DOCUMENT RESUME

ED 028 111 SP 002 214

By-Gage, N. L.

Research on Cognitive Aspects of Teaching.

Association for Supervision and Curriculum Development, Washington, D.C.; National Education Association, Washington, D.C. Center for the Study of Instruction.

Pub Date 66

Note-16p.; Pp. 29-44 in The Way Teaching Is (Report of the Seminar on Teaching.)

Available from-National Education Association, 1201 16th St., N.W., Washington, D.C. (The Way Teaching Is, Stock No. 381-11752, HC $1.50. Quantity discount.)

EDRS Price MF-$0.25 HC Not Available from EDRS.

Descriptors-*Cognitive Development, Educational Research, *Research Needs, *Teaching

There has been no major research, comparable to research on the social and emotional aspects of teaching, which focuses on teaching behavior as related to student achievement of cognitive objectives. The descriptive research of today, even if it were to correlate teaching behavior and learning, would still share a drawback with the research on noncognitive variables: studying teaching and teachers as they are restricts the quality of teaching to that of today's best teachers. What is needed, as Stolurow proposes, are models of the teaching process which would embody computer-based facilities for programed instruction and would predict learning outcomes that can be tested and corrected. Programed instruction has the benefit of being able to cope with the complexity of teaching (a factor in the difficulty of determining what in teaching behavior influences learning) and the momentary as well as permanent differences among students. Such a new approach would permit isolation of specific cognitive aspects such as oral explanations. (A 14-item reference list is included.) (LP)

ED028111

Permission to reproduce this copyrighted work has been granted to the Educational Resources Information Center (ERIC) and to the organization operating under contract with the Office to Education to reproduce documents included in the ERIC system by means of microfiche only, but this right is not conferred to any users of the microfiche received from the ERIC Document Reproduction Service. Further reproduction of any part requires permission of the copyright owner.

RESEARCH ON COGNITIVE ASPECTS OF TEACHING

N. L. Gage
Stanford University

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

By research on cognitive aspects of teaching, I mean something fairly restricted. By research, I mean, of course, the quest for relationships between variables, preferably causal relationships, or functional relationships, but if not these, then mere correlations of any kind. By research on teaching, I mean research in which at least one of the variables consists of a behavior or characteristic of teachers—something that the teacher does or is. It might be the teacher's explaining something, or his characteristic of being warm or logical.

The behavior or characteristic of teachers may serve as the dependent variable in relation to some way of recruiting, selecting, training, or supervising teachers. In that event, I would say that the study constitutes a piece of research on teacher education.

On the other hand, the behavior or characteristic of teachers may serve as the independent variable, in relation to some kind

SP002214

PROCESS WITH MICROFICHE AND PUBLISHER'S PRICES. MICROFICHE REPRODUCTION ONLY.

of behavior or characteristic of pupils. Then the investigation constitutes research on teacher effectiveness, or, as I prefer to call it, research on teacher "effects"—a term which, I feel, is less entangled with arguable assumptions about what is desirable.

So far, I have defined research, research on teaching, and its two subcategories—research on teacher education and research on teacher effects. Now, what about the third term in the title of this paper, the term *cognitive*? Here I refer to those aspects of teaching that are directly concerned with furthering the learner's achievement of the so-called cognitive objectives of education, as distinguished from affective or psychomotor objectives. The cognitive objectives are various kinds of knowledge—defined as ability to recall or recognize facts, definitions, laws, and so on—and various kinds of intellectual arts and skills, such as ability to analyze, evaluate, synthesize, translate, interpret, and so on. I propose to concentrate here on research on teacher effects which is directly, expressly, and obviously concerned with cognitive objectives, as distinguished from social and emotional aspects or objectives of teaching.

In doing so, I may exaggerate the distinction between cognitive and affective. As Gardner Murphy (1961) said, "if there is love to begin with, love can reach out and entwine within itself all of the things, acts, and relationships of this world. It can even come to love the very process by which it differentiates, analyzes, and makes meaningful reality out of this turbulent world" (p. 23). And the authors of the *Taxonomy of Educational Objectives in the Affective Domain* (Krathwohl, Bloom, and Masia, 1964) also noted the connection between cognitive and affective concerns. They observed that "under some conditions the development of cognitive behaviors may actually destroy certain desired affective behaviors. . . . For example, it is quite possible that many literature courses at the high-school and college levels instill knowledge of the history of literature . . . while at the same time producing an aversion to . . . literary works" (p. 20).

Nonetheless, it is possible to distinguish between cognitive and affective aspects of teaching; but this would require extensive treatment, and in this paper I propose to restrict my concern to the former.

THE RELATIVE NEGLECT OF COGNITIVE ASPECTS

Strangely enough, this restriction on my topic is a very severe one. Much of the literature of research on teaching is not cognitively oriented. Many if not most of the best known programs of research on teaching have been aimed at social and emotional aspects of how teachers behave and how pupils respond and develop. Indeed, it is probably also fair to say that the more successful programs of research on teaching have been noncognitively oriented. I can illustrate this point with reference to testing, rating, and observational studies of teaching.

First, consider the research centered around the development, validation, and exploration of the *Minnesota Teacher Attitude Inventory* (Getzels and Jackson, 1963, pp. 508-22). This research has yielded positive results more consistently, perhaps, than any other kind of research on teaching and makes it possible to predict with better than chance success how well an elementary school teacher will be liked by his pupils, or how well he will get along with them. But this research does not deal with how much knowledge or understanding those pupils will achieve.

As a rating approach, consider Ryans' massive Teacher Characteristics Study (1960). That program dealt with how warm teachers are, how systematic and orderly they are as managers, and how enthusiastic and ebullient they are. So far as I know, these variables, which Ryans developed with great circumspection and diligence and which he explored in relation to many other characteristics of teachers, have not been shown, by him or anyone else, to be promising points of entry into the relationship between what teachers do and their pupils' achievement of knowledge or comprehension.

For an observational approach, let me refer to a third productive and still very active line of research on teaching, well exemplified by Flanders' research (1965) on classroom interaction. Flanders writes a number every three seconds in 1 of 10 categories to record whether the teacher or a pupil is talking and whether what is being said is approving, extending, questioning, or criticizing. These numbers are then converted to tallies in a 10 x 10 matrix which shows what kind of behavior, as indicated on the vertical axis, was followed by what kind of behavior, in the next three seconds, as indicated on the horizontal

axis. By summing columns and various groups of cells in such matrices, Flanders can tell us a great deal about how directly or indirectly teachers behave, how pupils behave, and how the teacher and his pupils interact. Although he has studied the relationships between various measures derived from his interaction analysis and how much pupils learn in mathematics and English classes, it seems to me that Flanders' direct concern, as reflected in the categories of behavior he observes, is not with cognitive aspects of teaching.

My point is not merely that the *MTAI* research, the Ryans research, and the Flanders research are highly representative of a large part of the research on teaching that has been done thus far, and that these are among the most fruitful research undertakings of their kind. Rather I am noting that we have almost nothing of comparable scope, significance, and influence in the field of research on cognitive aspects of teaching.

It would be interesting, it seems to me, for a historian of ideas to attempt to explain this relative neglect. Perhaps he would find that, prior to the middle 1950's, American educational psychology and educational research as a whole, and not merely research on teaching, were too little concerned with cognitive learning, as against emotional and social development, in the classroom, school, and community. Perhaps he would find that American educational psychology was bogged down in too much respect for the kind of global learning theory cultivated by animal and laboratory psychologists, which yielded little but banalities when it was applied to the problems of school learning. Perhaps the historian would find that advances in dealing with instruction had to wait for the emergence of a substantial cadre of experimental psychologists from the training laboratories of the military; for it was in those military training installations that many of our most productive research workers, who entered them as brass-instrument experimental psychologists, became educational psychologists with a flair for analyzing instructional problems.

Whatever the historian might find, the fact remains that in research on teaching for cognitive objectives we have had relatively little of the descriptive, analytical, theoretical, experimental, or correlational work that can be found in relative abundance in research on the social and emotional phenomena found

in classrooms. I may be overstating or distorting the case, for we have had substantial enterprises on methods of teaching reading, arithmetic, science, languages, and so on. And to some extent, this research has become more analytical and more detailed than such gross variables as lecture-vs.-discussion method would indicate. But we have not had any major effort, until recently, toward *general* formulations of principles of teaching behavior as related to achievement of cognitive objectives.

RECENT RESEARCH ON COGNITIVE ASPECTS

Now I should like to turn to various exceptions to the generalization I have been making. Indeed, in the last five years or so, there have been direct attacks on cognitive aspects of teaching on the parts of such workers as B. O. Smith, Arno Bellack, Hilda Taba, and David Ausubel. There have been others, of course, but these are quite representative of recent developments.

Smith and Meux (1962, 1964) have analyzed transcripts of tape recordings of oral discourse in 17 high school classes, in English, mathematics, science, and social studies. Assuming that the influence of instruction is primarily logical—and this is, of course, a crucial assumption—they have identified the units of verbal discourse which can be sorted into different logical categories, each one coordinate with such a logical operation as "defining," "explaining," "evaluating," and "classifying."

Apart from these logical "tactics" in classroom discourse, Smith and his co-workers have also worked with larger units called "strategies," by which they mean the large-scale maneuvers that give general direction to student behavior.

Underlying their strategies are intermediate units of discourse which Smith and his co-workers call "ventures"; these are "segments of discourse consisting of a set of utterances dealing with a single topic and having a single overarching content objective."

Although my description of the work of this Illinois group is quite cursory, I have perhaps told enough to give the flavor of their approach. They are, in essence, concerned with a detailed analysis of logical, cognitive, intellectual aspects of classroom discourse. They do not intervene in, interfere with, manipulate, or change the phenomena prior to their being recorded. Nor do

they impose programed instruction or give tests. Hence their raw data reflect classroom intellectual life as it is lived without the influence of the investigator.

Let me turn now to a brief consideration of the work of Bellack and his collaborators (1963). They also have analyzed transcripts of linguistic behavior—that of 15 high school classes studying a unit in international trade in four class periods. Their analysis yielded four categories of pedagogical moves: structuring, soliciting, responding, and reacting. They also identified a variety of teaching cycles, or groups of moves. They identified four types of meanings in the content of discourse and termed these the "substantive," "substantive-logical," "instructional," and "instructional-logical" meanings of the content. Their results consist of detailed descriptions of the discourse in the classrooms studied, in terms of each of the major categories of meaning and some of the more important relations among categories. It is noteworthy that they found much more variability among their teachers in the substantive meanings covered in the classroom than in the teaching techniques used, despite the fact that all classes were supposed to be dealing with the same subject matter, carefully delimited. These investigators also took a step beyond the Smith-Meux research in that they investigated the amount of learning that occurred in each of their 15 classes. They did not find what they expected; namely, they did not find greater learning about topics most discussed than they did about topics least discussed in the classroom. They draw from this finding the lesson that "instead of setting up certain bits of knowledge as those which *should* be learned . . . , it would undoubtedly be more useful to formulate future research in terms of the question, 'What kinds of classroom events are related to what kinds of learning outcomes?' "

It should be noted that Smith regards his work as "neither an evaluative nor an experimental investigation of teaching." The same may be said of Bellack's studies. Little or no attempt was made to determine the effects of teaching behavior upon students, or to establish correlations among variables, or to search for causes of teacher behavior. Analytic and descriptive in the natural history sense, theirs is an effort to analyze verbal teaching behavior into pedagogically significant units and to analyze the units in logically meaningful ways.

It seems to me that a major difficulty with the descriptive approaches taken by Smith and by Bellack is that they have no way of knowing whether the variables they are studying are relevant to teaching. Not everything that teachers do is relevant to the purposes for which we study teaching. We typically do not concern ourselves with how teachers scratch their heads, hold their chalk, or cross their legs, for the simple reason that we assume such behaviors to be irrelevant to the kinds of learning the teachers bring about in pupils.

Is not the naturalistic description of teaching a worthwhile undertaking in itself? It is, indeed. Some geologists find Northwestern Canada, or any other area on earth, an important object of study in its own right, and they describe it carefully in terms of the constructs and variables of geological science. But other geologists go into Northwestern Canada for a different purpose; they want to find oil or gold, and they guide their search accordingly. At the moment, I am feeling like the latter kind of geologist: I want to study teaching for the purpose of improving learning.

If you are like me, then we must all be impatient for evidence that the logical aspects of classroom discourse with which Smith has been concerned or that the categories of meaning in classroom language with which Bellack has been concerned are indeed relevant to changes in the knowledge or understanding of pupils. By all that is plausible, the logical and substantive content of classroom discourse ought to have some connection with what knowledge and comprehension pupils acquire. But we have been fooled before in educational research, and I, for one, shall rest uneasy until the evidence on these plausible but undemonstrated connections is in. It would be a shame, indeed, if the truly prodigious labors in content analysis that Smith and Bellack and their co-workers have expended should turn out to be as irrelevant to what pupils learn as chalk twiddling presumably is. Their data would still interest the naturalists among us, but society has a primary interest in what pupils learn.

ACTIVE VS. PASSIVE RESEARCH ON TEACHING

Now I should like to turn to a distinction between two basically different strategies in research on teaching. Smith and

Bellack, with their cognitive categories, and the *MTAI*, Ryans, and Flanders researches, with their noncognitive variables, have one big thing in common. These programs study teaching and teachers as they are. If these approaches someday find substantial differences between good teachers, defined as those who foster much knowledge and comprehension, and poor teachers, who foster little, they will still have discovered something about teaching only as it now goes on. They would then have a basis for improving teaching, to be sure, by educating more teachers to be like the good teachers of today and educating fewer teachers to be like the bad teachers of today. But the upper limit on quality of teaching, by this strategy, is today's best teachers. Such research cannot, in principle, go beyond the best we presently have, unless one synthesizes a superior model by combining features from several existing teaching patterns or strategies.*

Now suppose we assume, not too implausibly, that even the best that we now have for teaching toward cognitive objectives is not very good. Then the strategy of studying "the way teaching is," even if it pays off in the possible ways I have just indicated—and so far, after many years, it has hardly begun to pay off in this way—is not going to get us very far.

Furthermore, let us look at the chances that it will pay off, even in this limited way. As Stolurow (1965) and many others have noted, teaching behavior is complex. Consequently, it is difficult to interpret what one observes in it. It is difficult to attribute student learning to particular teacher behaviors. Also, it is not unlikely that ineffective teaching behaviors could be identified even in master teachers. Thus, all these factors serve to make the approach of what Stolurow calls "modeling the master teacher" ineffective. That is, says Stolurow, "this idea of modeling the master teacher has not worked" (p. 225). He goes on to say that—

> The most significant conclusion that can be drawn from efforts to use teachers as a basis for information about teaching is that effective instruction can be produced by a variety of combinations of characteristics and conditions rather than by one unique combination. If this were not the case, efforts to enumerate the characteristics of good teachers would have resulted in the iden-

* For the latter point, I am indebted to Ray L. Debus (personal correspondence).

> tification of at least one or two critical characteristics. However, neither the observation of master teachers nor that of a large number of effective teachers . . . has led to findings that are either substantial or sufficient for the understanding of teaching as a process. Thus, an alternative approach is needed (p. 226).

What is Stolurow's alternative approach? He calls it "mastering the teaching model." He begins by making the point that "it may be possible to do a better job of teaching than that which has been observed" (p. 226). If so, "then it is unwise to *restrict* one's concern to what teachers are doing now" (p. 227).

Stolurow proposes that we set out to develop, *de novo*, more or less, models of the teaching process designed to predict learning outcomes. Such models will force the investigator to make explicit the elements and relationships needed to account for the phenomenon in which he is interested, namely, the student's achievement of a learning task. Such models entail commitment to a position. If properly designed, the models can be tested and corrected.

PROGRAMED INSTRUCTION

This is not the occasion to go into the details of such models. In general, Stolurow has in mind the kinds of models embodied in computer-based facilities for programed instruction. Such models provide for the presentation of cognitive content, on a screen or typewriter or some other device, for the pupil's responding in some way, for immediate comparison of the response with a criterion, for immediate feedback of knowledge of results, for rapid searching of the library for frames or materials to be presented next, and so on, along lines with which you are all familiar.

At present such models, and their materialization in hardware and programs, are no longer pipe dreams. They exist at a half dozen research centers around the nation, and millions of dollars and scores of brilliant minds are being invested in them. The centers are moving rapidly, and pilot studies have yielded no results to dim the optimism of their developers.

The Argument from Complexity

One argument for programed instruction is that adequate analyses of teaching for cognitive objectives show that, ade-

quately done, such teaching is extremely complex. Such analyses reveal demands on the teacher that look well-nigh impossible for ordinary mortals, like teachers, to meet. Consider the following statements by Hilda Taba (1963) in "Teaching Strategy and Learning" concerning the implications of her study of what the teaching of concept formation entails:

> Decisions must be made regarding the adaptation of the sequential steps required for a particular cognitive task to the possibilities of the group: how to pace each step, or to combine certain processes, such as alternating specification and classification of information and generalizing; deciding when it is possible to shift the focus, or to lift the level of thought, such as shifting from description ("What") to explanation ("Why"), and so on. Attempts to lift thought prematurely to a higher level result either in confusion or regression to the more primitive level. The chief difficulty with the current teaching procedure is that while the subject moves on, there is no corresponding movement in the maturity of thought. Providing for cumulative growth in cognitive skills is a requirement against which the current teaching practice commits the greatest errors. . . .
>
> Decisions regarding the pacing and progressive lifting of thought levels naturally depend on accurate diagnosis of the group's quality of performance. Depending on both their ability and previous habits of thought, some groups require a more prolonged enumeration before they can group similar items successfully, while others can do with less. Some students can readily grasp the idea that grouping must be done according to some definite basis, while others may need to "mess around" for a while until they "discover" this idea. . . . Since the particular response patterns differ radically from class to class and even from individual to individual, these matters inevitably must be decided "on the spot," so to say. While the general principles of sequence can be established beforehand, their particular application and the ways of coping with the divergent student performance can be mastered only "in the process" and aided through analysis of feedback.

This is only an example of the kind of complexity that teaching for certain kinds of cognitive objectives must face. If Taba's analysis is valid, and it certainly sounds valid, then we ought to face the question of whether teachers can ever be trained to cope with such complexities on anything approaching a scientific basis.

The Argument from Individualization

Apart from the problem of complexity, consider the problem of individualization. Even if a teacher can do the job properly for *groups* of pupils—and notice that Taba speaks of such groups—how can he ever adapt the process to the needs of 30 *individuals* at a time? As we all know, pupils differ among themselves and within themselves in many important determiners of their readiness to learn. On any given day, in any given class, some pupils are brighter in general, more able in some special skill, better motivated, better adjusted to the group, and so on, than are other pupils. It is to cope with this fact, and with the implication that teaching ought therefore to be individualized, that educators have developed many kinds of administrative provisions and teaching methods, such as homogeneous grouping, special classes for slow learners and superior learners, supplementary classes and tutoring, nongraded schools, retention and acceleration procedures, frequent promotion plans, parallel-track plans, contract and unit plans, team teaching, teacher aides, and special activities and assignments for groups and individuals within the class (Thomas and Thomas, 1965).

These individualization techniques have their possibilities. But we are finally beginning to grasp, through such analyses as Taba's, the full demands of instruction for certain kinds of cognitive objectives. Even if pupils are made homogeneous in stable characteristics, such as general ability or achievement in reading, they will not be homogeneous in certain of their *momentary* yet important characteristics, such as the stage they have reached in learning a given concept.

Let me digress to note that the problem of individualization is neglected in most research on teaching. Even in reviews of recent research, we find little concern with the behaviors of teachers in attempting to cope with individual differences in the classroom. Programed instruction seems to me to have much greater potential, both in theory and in practice, for coping with such complexities in ways adaptable to the requirements of individual pupils. It is undoubtedly to be interpreted a sign of the times that Thomas and Thomas (1965) in their work treat programed materials as a major approach to meeting intellectual differences.

In short, research on how teachers now attempt to foster certain kinds of knowledge and comprehension may need to be reexamined as programed instruction gains momentum, especially as computer-based programed instruction matures. As of now, the advocates of programed instruction have the advantage on certain theoretical issues in learning and instruction. As compared with programed instruction, teachers are less able to present ideas in meticulously planned patterns, they are less able to require the pupil to make specified responses, they are less able to provide him with individualized feedback or correction, they are less able to adjust themselves to the pace and needs of every individual pupil, they are less able to adapt themselves to cues from individual students in the form of various kinds of correct cr incorrect responses.

If the promise of computer-based instruction is not merely illusory, then for some kinds of cognitive objectives the teacher can be enormously supplemented by programed instruction. But, in any case, programed instruction provides a powerful research tool for attempting to master the teaching model. That is, it provides a highly controllable and replicable means of seeking and inventing better ways of instructing.

We shall always need live teachers engaged in instruction for cognitive objectives of the many important kinds with which programed instruction cannot cope. But the role of such teachers will need to be reexamined. We must, of course, remember that the teacher is not merely aiming at cognitive objectives. As Briggs (1964) has noted, teachers are needed in arranging for problem solving by groups, in guiding social development, in providing enrichment and special projects based on individual needs and interests, and in providing training that requires supervised practice—such as laboratory procedures, report writing, interviewing, or playing a musical instrument. Briggs also points out that the teacher is needed for "recognizing and rewarding creativity, administering achievement tests, answering the odd question not covered in the program, updating the information if necessary, and assigning units of work based on student abilities and goals" (p. 274). As is the case with other inventions, the new methods of instruction, programed and otherwise, will not supplant the old methods so much as they will supplement them.

A NEW APPROACH TO RESEARCH ON TEACHING

I should like finally to describe a new approach to research on teaching. Although it applies to any kind of teacher behavior, I shall describe the approach in terms of a program of investigation into the oral explanations of teachers. Such explanations occur in teaching at all grade levels and in all subject matter areas; the primary grade teacher explains why seeds have different shapes, and the professor explains DNA as a mechanism of heredity. Some teachers explain aptly, getting to the heart of the matter in just the right way, while other teachers somehow confuse their pupils.

Little research, however, has been concerned with the teacher as explainer. Research concerned with cognitive aspects of classroom teaching has not appraised the effects of explanations; it has been either descriptive and observational, or confined to printed explanations.

A pilot study, done at the University of Illinois by Rudin (1961), can illustrate part of what I have in mind. Rudin had seven student teachers lecture for 10 minutes to fifth- and sixth-grade classes, explaining how volcanoes may have caused the ice ages. Different teachers produced significantly different amounts of comprehension in their pupils as measured by their pupils' mean score on a post-test of comprehension, which was adjusted by analysis of covariance for initial differences between the classrooms in knowledge and interest in science, as measured by a pretest. In short, the teachers seemed to differ in ability to explain, although other interpretations are possible.

We are now attempting to determine the degree to which such differences in ability to explain are general over subject matters and over groups of pupils. Is there a positive correlation between the ability of teachers to explain Topic A to one group of pupils and their ability to explain Topic B to a second group of pupils? If such correlations are substantial enough, we can conclude that the ability to explain orally is indeed a general one in these senses. We would then go on to select good and poor explainers from a sizable number of teachers whose ability to explain had been measured in this way, that is, in terms of the adjusted mean post-test comprehension scores of their pupils. We shall then study video-tape recordings of the explaining

behavior of such extreme groups of teachers to learn what effective explaining behavior is. In the long run, the next step would be to invent kinds of teaching behavior that could be tried experimentally, probably taking our leads from the kinds of analyses of classroom discourse that have been made by Smith, Bellack, Ausubel, Taba, and others, and also from those who have been attempting to develop principles of programing.

My first point about this approach is that it deals with a relatively specific aspect of teaching, such as explaining. Other such aspects might be questioning, introducing a new learning set, or encouraging participation. My second point is that we begin with the criterion of effectiveness, or a "micro-criterion" (Gage, 1963, p. 120) already in hand; we know which teachers are more effective and which are less effective in a given sense before we begin to study their behavior. And my final point is that we can study the teacher's behavior after it has occurred, at leisure, with as much repetition as is necessary, because we have a video-tape record of the teacher's verbal and nonverbal behavior, taken under unobtrusive conditions, at the moment when the pupil learning was being engendered.

REFERENCES

Bellack, Arno A., and Davitz, Joel R., in collaboration with Kliebard, Herbert M., and Hyman, Ronald T. *The Language of the Classroom: Meanings Communicated in High School Teaching.* U.S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 1497. New York: Institute of Psychological Research, Teachers College, Columbia University, 1963.

Briggs, Leslie J. "The Teacher and Programed Instruction: Roles and Role Potentials." *Audio-Visual Instruction* 9: 273-76; May 1964.

Flanders, Ned A. *Teacher Influence, Pupil Attitudes, and Achievement.* U.S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Monograph No. 12 (OE-25040). Washington, D.C.: Government Printing Office, 1965.

Gage, N. L. "Paradigms for Research on Teaching." *Handbook of Research on Teaching.* (Edited by N. L. Gage.) Chicago: Rand McNally & Co., 1963. pp. 94-141.

Getzels, J. W., and Jackson, P. W. "The Teacher's Personality and Characteristics." *Handbook of Research on Teaching.* (Edited by N. L. Gage.) Chicago: Rand McNally & Co., 1963. pp. 506-82.

Krathwohl, David R.; Bloom, B. S.; and Masia, B. B. *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook II: Affective Domain.* New York: David McKay Co., 1964.

Murphy, Gardner. *Freeing Intelligence Through Teaching.* New York: Harper & Brothers, 1961.

Rudin, Stanley A. "Measuring the Teacher's Effectiveness as a Lecturer." *Journal of Genetic Psychology* 98: 147-54; March 1961.

Ryans, David G. *Characteristics of Teachers.* Washington, D.C.: American Council on Education, 1960.

Smith, B. Othanel, and Meux, Milton O., in collaboration with Coombs, Jerrold; Eierdam, Daniel; and Szoke, Ronald. *A Study of the Logic of Teaching.* U.S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 258(7257). Urbana: Bureau of Educational Research, College of Education, University of Illinois, 1962.

Smith, B. Othanel, and others. *A Tentative Report on the Strategies of Teaching.* U.S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 1640. Urbana: Bureau of Educational Research, College of Education, University of Illinois, 1964.

Stolurow, Lawrence M. "Model the Master Teacher or Master the Teaching Model." *Learning and the Educational Process.* (Edited by John D. Krumboltz.) Chicago: Rand McNally & Co., 1965. pp. 223-47.

Taba, Hilda. "Teaching Strategy and Learning." *California Journal for Instructional Improvement,* December 1963. (Unpaginated reprint.)

Thomas, R. M., and Thomas, Shirley M. *Individual Differences in the Classroom.* New York: David McKay Co., 1965.